

ARMY AVIATION SYSTEM SURVIVABILITY

General. As an integrated member of the combined arms team, the mission of Army Aviation is to find, target, and destroy the enemy through fire and maneuver and to provide combat support and combat service support in coordinated operations. During combat operations, aviation forces have organic maneuver and firepower capability, the ability to gather intelligence, and the lift capability to conduct air operations in the close, deep, and rear battle areas. Aviation allows commanders to exploit the entire battlefield. During both offensive and defensive combat operations, aviation performs: reconnaissance, air assault, security, attack, medical evacuation, search and rescue, special operations, and other missions vital to the success of the combined arms team.



The Threat. The threats to Army aviation systems fall into five categories: ballistic weapons, electronic warfare, to include information warfare, directed energy weapons, chemical and biological weapons, and nuclear weapons.

Threat Avoidance. Realistic training and tactics that exploit the strengths of particular aircraft while avoiding their weaknesses are significant contributors to their survivability. However, the focus of this discussion is on how Army aircraft can be designed and equipped to minimize their susceptibility and vulnerability to encountered threats. Aviation survivability technologies are grouped into four separate threat avoidance categories: detection avoidance, hit avoidance, damage avoidance, and kill avoidance.

1. **Detection Avoidance.** Detection avoidance includes all the technologies and methods used to suppress the sights, sounds, and images normally associated with aircraft. Making aircraft harder to find makes them harder to kill, which substantially increases their lethality. Great gains in survivability and lethality are achieved due to detection-avoidance technologies, but these technologies are also normally the highest in cost to develop, integrate, and maintain.

2. **Hit Avoidance.** Hit avoidance refers to technologies that allow an aircraft to avoid being hit by a weapon after the aircraft has been detected by the enemy. Hit avoidance includes avoidance of both acquisition and tracking by enemy fire control and interception by enemy weapons. Most hit avoidance technologies are not stand-alone; they are integrated into systems that deflect, disorient, or defeat the threat.

3. **Damage Avoidance and Tolerance.** After being detected and hit, aircraft rarely are able to prevent threat penetration. Aircraft rely on damage avoidance instead. Damage avoidance is

accomplished through the use of ballistic shielding separation, electronic and nuclear, biological, and chemical (NBC) filters and overpressure as well as in the developmental Comanche Scout/attack helicopter.

4. **Kill Avoidance.** Kill avoidance technologies permit an aircraft and its crew to live and fight another day after being detected, hit, and damaged. These technologies include NBC crew protection systems, fire detection and suppression, optics and electronics hardening, critical component redundancy, component separation, and shielding of critical components by less critical components and selective armoring of cockpit crew areas.

Survivability Enhancement. Survivability is enhanced by technologies that make aircraft and aircrew less susceptible (harder to detect and harder to acquire and hit) and less vulnerable (harder to damage and harder to kill). The potential of various future aviation systems, system upgrades, and advanced concepts to enhance aircraft survivability is addressed in this context. The spectrum of opportunities to interrupt the process that leads to the loss of an aircraft and its crew is illustrated in Figure 1. Included are general means by which the interruption can be caused.

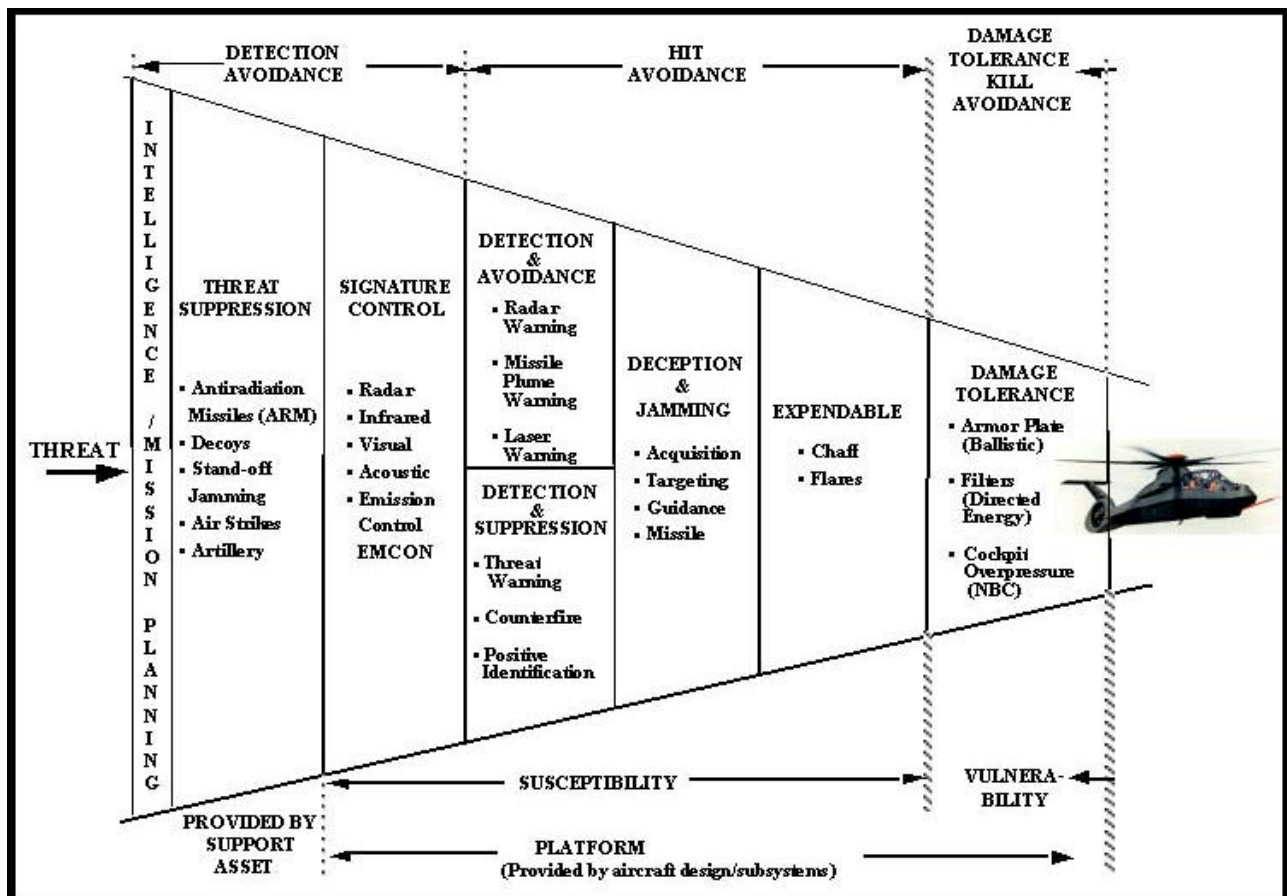


Figure 1. Spectrum of Survivability Enhancement Opportunities

Improving Aviation System Survivability. Considerable attention has been given to damage and kill avoidance by building ballistic tolerance features into the Army's more modern aircraft. Although generally an effective defense against ballistic projectiles, ballistic tolerance features that are feasible for aviation systems are minimally effective at damage or kill avoidance when the hit is from a guided missile. Additionally, the development and proliferation of electronic, directed energy, and NBC threats added to the growing sophistication of ballistic threats will require aircraft to face a much greater array of survivability issues than ever before. Incorporating detection and hit-avoidance features for electronic, directed energy, and NBC threats, in addition to those designed for ballistic threats, is essential.

Suggested Areas of Concentration. The following areas of concentration are indicated as promising and significant enhancements in aviation systems survivability:

- Night and adverse weather operating, surveillance, target and threat acquisition, and targeting capabilities to enhance threat detection and hit avoidance.
- Tolerance to directed energy weapons (laser) concentrating in the near- and mid-terms on human eye and optical sensor protection.
- Airborne capability to detect areas of NBC contamination.
- Tolerance of avionics to EMP, DEW (High Power Microwave)

The Way Ahead. The Army has embarked on a modernization strategy to develop warfighting capabilities using available systems and technical insertions to satisfy the need to be more strategically responsive and capable in meeting commander-in-chief requirements for small-scale contingencies without compromising our Major Theater War capability. Army Aviation will keep pace with the Army strategy through modernization (the development and/or procurement of new systems with improved warfighting capabilities) and recapitalization (the rebuilding and selected upgrading of currently fielded systems to ensure operational readiness). Modernizing Army aviation systems is a continuous, incremental process designed to integrate, package, and provide synergy to aircraft lethality, command and control, mobility, survivability, and sustainment capabilities on the twenty-first century battlefield. With the Army reducing the number of new warfighting systems developed and produced in the foreseeable future, the smaller number of systems deployed to the world's trouble spots must overmatch any potential adversary in terms of lethality and survivability.

More detailed discussions on aviation systems threats, vulnerabilities, and survivability enhancements are contained in the Aviation Annex to the Army Weapon Systems Survivability Summary (TASSS). This limited distribution ARL publication may be obtained by contacting the Survivability/ Lethality Analysis Directorate, ATTN: Mr. Connie Hopper, U.S. Army Research Laboratory, White Sands Missile Range, NM 88002, Telephone: (505) 678-1196, DSN 258-1196, or email: chopper@arl.army.mil.